### Key Terms

dynamics

study of how forces affect the motion of objects and systems

external force

force acting on an object or system that originates outside of the object or system

force

push or pull on an object with a specific magnitude and direction; can be represented by vectors or expressed as a multiple of a standard force

free fall

situation in which the only force acting on an object is gravity

free-body diagram

sketch showing all external forces acting on an object or system; the system is represented by a single isolated point, and the forces are represented by vectors extending outward from that point

Hooke’s law

in a spring, a restoring force proportional to and in the opposite direction of the imposed displacement

inertia

ability of an object to resist changes in its motion

inertial reference frame

reference frame moving at constant velocity relative to an inertial frame is also inertial; a reference frame accelerating relative to an inertial frame is not inertial

law of inertia

see Newton’s first law of motion

net external force

vector sum of all external forces acting on an object or system; causes a mass to accelerate

newton

SI unit of force; 1 N is the force needed to accelerate an object with a mass of 1 kg at a rate of

Newton’s first law of motion

body at rest remains at rest or, if in motion, remains in motion at constant velocity unless acted on by a net external force; also known as the law of inertia

Newton’s second law of motion

acceleration of a system is directly proportional to and in the same direction as the net external force acting on the system and is inversely proportional to its mass

Newton’s third law of motion

whenever one body exerts a force on a second body, the first body experiences a force that is equal in magnitude and opposite in direction to the force that it exerts

normal force

force supporting the weight of an object, or a load, that is perpendicular to the surface of contact between the load and its support; the surface applies this force to an object to support the weight of the object

tension

pulling force that acts along a stretched flexible connector, such as a rope or cable

thrust

reaction force that pushes a body forward in response to a backward force

weight

force due to gravity acting on an object of mass *m*